

MATERIAL SAFETY DATA SHEET

SRM Supplier: National Institute of Standards and Technology
Standard Reference Materials Program
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SRM Number: 2660a
MSDS Number: 2660a
SRM Name: Total Oxides of Nitrogen in Air
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SECTION I. MATERIAL IDENTIFICATION

Material Name: Total Oxides of Nitrogen in Air

Description: This SRM mixture is supplied as a compressed gas in a DOT 3AL specification aluminum (6061 alloy) cylinder equipped with a CGA-660 stainless steel valve at a nominal pressure of 12.4 MPa (1800 psi). NIST recommends that this cylinder **NOT** be used below 0.7 MPa (100 psi).

Other Designations: **Total Oxides of Nitrogen** (nitrogen dioxide; nitrogen peroxide; nitrogen oxide; nitrite radical) in Air Gas Cylinder

Name	Formula	CAS Registry Number
Compressed Air	O ₂ /N ₂ (major components)	132259-10-0
Nitrogen Dioxide	NO ₂	10102-44-0

DOT Classification: Non-flammable Gas, UN1956

SECTION II. HAZARDOUS INGREDIENTS

Hazardous Components	Nominal Concentration	Exposure Limits and Toxicity Data
Nitrogen Dioxide	100 µmol/mol	OSHA Ceiling: 9 mg/m ³
		OSHA STEL: 1.8 mg/m ³
		ACGIH STEL: 9 mg/m ³
		NIOSH STEL: 1.8 mg/m ³
		Human, Inhalation: LC _{Lo} : 200 mg/kg/1 min
		Man, Inhalation: TC _{Lo} : 2 mg/kg/4 h
		Human, Inhalation: TC _{Lo} : 0.2 mg/m ³ TC _{Lo} : 0.059 mg/m ³ /5 min
Compressed Air	balance	no occupational exposure limits established

SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

Nitrogen Dioxide	Compressed Air
Appearance and Odor: colorless to brown gas; irritating odor	Appearance and Odor: colorless gas; odorless
Molecular Weight: 46.01	Molecular Weight: not applicable
Vapor Density (air = 1): 1.58	Vapor Density (air = 1): 1.0
Odor Threshold: 5 mg/kg (5 ppm)	Odor Threshold: not available
Water Solubility: soluble and reacts with water to form nitric acid and nitric oxide	Water Solubility: slightly soluble
Solvent Solubility: concentrated sulfuric acid, nitric acid, carbon disulfide, chloroform, alkali	Solvent Solubility: not available

NOTE: The physical and chemical data provided are for the pure components. Physical and chemical data for this nitrogen dioxide/compressed air mixture **DO NOT** exist. The actual behavior of the gas mixture may differ from the individual components.

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point: Nonflammable

Autoignition Temperature: Not Applicable

Flammability Limits in Air (Volume %): **UPPER:** Not Applicable
LOWER: Not Applicable

Extinguishing Media: Nitrogen dioxide does not burn. Nitric dioxide decomposes in water forming nitric acid and nitric oxide; however, a water spray will dilute the nitric acid and absorb the liberated oxides of nitrogen. **DO NOT** use dry chemicals, carbon dioxide or halogenated extinguishing agents. Use extinguishing media that is appropriate to the surroundings.

Special Fire Procedures: Fire fighters should wear a self-contained breathing apparatus (SCBA). Keep fire exposed cylinders cool with water spray until well after the fire is out. If possible, stop the product flow.

Unusual Fire and Explosion Hazards: Air and nitrogen dioxide are negligible fire hazards. Nitrogen dioxide is an oxidizer. Nitrogen dioxide may ignite or explode on contact with combustible materials. Cylinders may rupture under conditions of fire.

SECTION V. REACTIVITY DATA

Stability: X **Stable** **Unstable**

Nitrogen dioxide is stable at normal temperature and pressure.

Conditions to Avoid: Protect cylinders from physical damage and heat. **DO NOT** store material in poorly ventilated areas. Avoid contact with combustible materials.

Incompatibility (Materials to Avoid): Nitrogen dioxide is incompatible with combustible materials, metals, bases, metal oxide, reducing agents, metal carbide, halo carbons, halogens, oxidizing materials, metal salts, amines, acids.

See Section IV: "Fire and Explosion Hazard Data".

Hazardous Decomposition or Byproducts: Thermal decomposition of nitrogen dioxide may produce oxides of nitrogen.

Hazardous Polymerization _____ **Will Occur** _____ **X** **Will Not Occur**

SECTION VI. HEALTH HAZARD DATA

Route of Entry: _____ **X** **Inhalation** _____ **X** **Skin** _____ **Ingestion**

Health Effects (Acute and Chronic): Nitrogen dioxide may cause respiratory tract, skin, and eye burns. Inhalation is potentially fatal.

Eye Contact: Direct contact of nitrogen dioxide vapors or evaporation of the liquid may cause severe irritation with redness, pain, blurred vision, edema of the eyelids, corneal ulceration, possible burns, and frostbite. Chronic effects caused by repeated or prolonged contact depend on the concentration and duration of exposure. Chronic effects may include conjunctivitis or effects similar to acute exposure.

Skin Contact: Direct contact with nitrogen dioxide vapors or rapid evaporation of the liquid may cause severe irritation, pain, frostbite, and possibly burns. Chronic effects caused by repeated or prolonged contact depend on the concentration and duration of exposure. Chronic effects may include dermatitis or effects similar to acute exposure.

Inhalation: A symptom free latent period may follow the time of exposure, lasting 5 - 72 hours, with the exception of a slight cough and perhaps fatigue and nausea. Low concentration exposure below 50 ppm (50 mg/kg) may result in impaired pulmonary defense mechanisms. Concentration exposure above 100 ppm (100 mg/kg) may produce prompt coughing and choking, headache, dizziness, nausea, and abdominal pain. Increasingly rapid and shallow respiration and physical signs of pulmonary edema may occur. Death by asphyxiation usually occurs within a few hours after the first evidence of pulmonary edema. Prolonged exposure to low concentrations may result in chronic irritation of the respiratory tract, headache, dizziness, sporadic cough, anorexia, indigestion, insomnia, gradual loss of strength, and chronic bronchitis.

Medical Conditions Generally Aggravated by Exposure: Not Available

Listed as a Carcinogen/Potential Carcinogen:

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	_____	<u> X </u>
In the International Agency for Research on Cancer (IARC) Monographs	_____	<u> X </u>
By the Occupational Safety and Health Administration (OSHA)	_____	<u> X </u>

EMERGENCY AND FIRST AID PROCEDURES:

Eye Contact: Immediately flush eyes with copious amounts of water for at least 15 minutes. Obtain medical assistance if necessary.

Skin Contact: Rinse skin with large amounts of water followed by washing the area with soap and water. Obtain medical assistance if necessary.

Inhalation: Remove victim from exposure. If breathing is difficult, qualified personnel should administer oxygen. If not breathing, give artificial respiration by qualified personnel. Obtain immediate medical assistance.

TARGET ORGAN(S) OF ATTACK: nitrogen dioxide: respiratory system, pulmonary system

SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled: Evacuate and ventilate the area. Remove leaking cylinder to an exhaust hood or a safe outdoor area. Shut off source if possible and remove from possible sources of heat. In case of leakage, use SCBA. Reduce vapors with water spray. Collect runoff for disposal as potential hazardous waste.

Waste Disposal: Dispose of non-refillable cylinders in accordance with federal, state, and local regulations. **DO NOT** return the empty cylinder to the supplier.

Handling and Storage: Secure cylinders at all times, when in use or storage, to protect from falling and physical damage. Use hand truck to move cylinders. Wear safety shoes when handling cylinders. Use adequate general and local exhaust ventilation to maintain concentration below exposure limits and to avoid asphyxiation. For eye protection, wear safety glasses.

NOTE: Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the laboratory.

Store in cool, dry, well-ventilated areas away from combustibles. Keep cylinders out of direct sunlight and away from heat sources. **DO NOT** allow the area where cylinders are stored to exceed 52 °C. Keep valve protection cap on cylinders when not in use.

SECTION VIII. SOURCE DATA/OTHER COMMENTS

Sources: Scott Specialty Gases, MSDS *Air, Compressed*, 09 September 1991.
MDL Information Systems, Inc., MSDS *Nitrogen Dioxide*, 18 September 2003.
MDL Information System, Inc., MSDS *Compressed Air*, 19 March 2003.

Disclaimer: Physical and chemical data contained in this MSDS are provided for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data in the MSDS. The certified values for this material are given only on the NIST Certificate of Analysis.